"AUXILIARY DEVICE FOR EXCAVATOR AND EXCAVATOR PROVIDED WITH SAID DEVICE"

Technical field of the invention

The present invention relates to an auxiliary device for an excavator and, in particular, an auxiliary gripping device for an excavator of the type with articulated arms.

Background of the invention

Excavators with articulated arms generally include a supporting structure, a platform mounted on the supporting structure and a plurality of articulated arms at which ends excavation tools are mounted, for instance buckets, shovels, or the like.

By the term "excavator" as is used herein, it is intended to identify also those excavators wherein the articulated arms are installed on a platform constituted by a frame which is mounted, in its turn, on a tractor, for instance like those that are installed on the rear of a grader or a farm tractor. Besides the already mentioned excavation tools, there can be mounted on the articulated arms also grip tools such as crampons to grasp for instance poles or tree trunks, or rake devices for handling hay, straw, etc.

In the excavators provided with an excavation shovel, the shovel is mounted on articulated joints or is hinged on a forearm and its movement is operated by an hydraulic jack, which in its turn acts on the shovel or one of its articulated joints of connection to the forearm.

A problem that affects the known excavators arises when it is necessary to handle loads having a size greater than that of the excavation tool. A particularly frequent example of such drawback is the finding of rocks during excavation works. Such rocks are often of such a size that it is not possible to handle them by utilizing the excavation tool only, while having a weight that allows to move them

with the excavator.

In this case, it is needed the intervention of other especially equipped machines that sometime are not directly available in the working site, or it might be necessary to replace the excavation tool and/or the forearm that supports the same. These operations involve particularly long times and can therefore delay works considerably.

As a partial solution of this problem, excavations tools have been realized that are provided with an articulated counter-shovel activated by a dedicated jack. However, this solution is expensive especially in that it requires a more powerful hydraulic system, and the overall dimensions of the additional auxiliary devices make its adoption on reduced size machines difficult. Besides, the adoption of the counter-shovel may be a hindrance to the usual excavation functions.

Summary of the Invention

Object of the present invention is to solve the aforesaid problems by proposing in particular an auxiliary device for excavators with articulated arms, suitable to give the excavators additional grip functions in a particularly simple and economical manner.

Another object of the present invention is to provide an auxiliary device of the aforesaid type that can be easily installed also on already existing excavators.

A further object of the present invention is to provide an auxiliary device of the aforesaid type that can be easily installed and removed in a short time.

Such objects are achieved thanks to an auxiliary device according to claim 1, or anyhow thanks to an excavator according to claim 10. Further characteristics are specified in the dependent claims.

In a first aspect of the present invention, there is provided an

auxiliary device for an excavator with articulated arms, provided with an excavation tool movable in rotation under the action of suitably control means. The auxiliary device includes at least one supporting element that can be fastened to at least one of the excavator articulated arms, at least one movable grip element and rigid mechanical connection means to mechanically connect the movable grip element to the excavation tool and transmit to the grip element a movement generated by the means for actuating the operation in rotation of the excavation tool.

In this way, the grip element is moved by the same means for operating the excavation tool, rendering thereby unnecessary the use of additional operating means and, therefore, the upgrade of the hydraulic system.

In particular, both the excavation tool and the grip element are mobile with respect to each other and approach until they reach a closing position, wherein it is possible to grasp and firmly retain a load, and moving away from each other until they reach an opening position that allow the unloading of the load.

The rigid mechanical connection means include rods that connect the grip element to an articulation system of the excavation tool. The connection to the articulation system is preferably obtained through a removable pin.

The grip element is movable in translation along a rectilinear direction and is slidingly mounted in suitable guide means included in the supporting element. The ends of the guide elements are advantageously open to allow an easy removal of the grip means from the same guide means.

Thus, the grip element can be easily removed in a few moments, if this should be necessary: actually, it suffices to release the

engagement between the pin and the rods in correspondence of the articulation joint and to extract the grip element from one of the ends of the guide means. The pin can be only slightly extracted to disengage the rods, locking it therefore again in its position in the corresponding articulation, whereby only the excavation function is restored. By carrying out the same operations reversed, it is possible to restore in a few moments also the grip function.

According to a second aspect of the present invention, an excavator with articulated arms is provided, that includes at least one excavation tool rotably mounted on one of the articulated arms and means for controlling the actuation in rotation of the excavation tool. The excavator advantageously includes an auxiliary device mounted on at least one of the articulated arms and having at least one supporting element and at least one movable grip element, as well as rigid mechanical connection means to connect the grip element to the excavation tool and to mechanically transmit to the grip element a movement generated by the means for actuating the operation in rotation of the excavation tool.

Preferably, the movable grip element includes a grip portion having a width smaller that the width of the excavation tool. This allows to maintain the grip element installed without hindering the excavation functions, and therefore to have it always available, should it be necessary to utilize it to remove loads, for instance blocks or the like, which may be found during the excavation.

The excavator according to the present invention has several advantages compared to the known art. In fact, the presence of the grip element allows to grasp and shift items having a size greater than those of a conventional excavation tool, such as for instance a shovel. In this way also the versatility of the machine is increased, which

beside being utilizable as an excavator may be also utilized for handling loads and materials without requiring the replacement of the excavation tool with other tools suitable for the purpose. In this manner, high loads can be handled, for instance trunks and poles, or light but difficult-to-grasp loads, for instance hay, straw, manure or the like.

Besides, thanks to the mechanical activation (instead of hydraulic activation) through the rigid mechanical connection means, the device can be produced economically and installed easily on already existing excavators, an additional jack for the activation of the grip element being unnecessary.

Brief description of the drawings

These and other advantages will be evident from the following description and the drawings attached by way of non limiting illustration, wherein:

- Figure 1 is a side view of the excavator with an auxiliary grip device according to the invention, with the excavation tool and the grip element in a mutual opening position;

- Figure 2 is a view similar to that of Figure 1, with the excavation tool and the grip element in a mutual opening position;

- Figure 3 is a rear view of the auxiliary gripping device mounted on an excavator according to the present invention, with the excavation tool and the grip element in a mutual opening position;

- Figure 4 is a perspective view of an excavator handling a load;

- Figure 5 is a cross-section view of some elements of the auxiliary device according to the present invention, mounted on an arm of an excavator; and

- Figure 6 is a plan view of the supporting element mounted on an arm of an excavator.

Modes for carrying out the invention

With first reference to Figures 1-4, the excavator 1 includes, as know in the art, an excavation tool 2, for instance a shovel, which is connected by a pin 3 to one of the articulated arms of the excavator, in particular to forearm 4, also known as thrusting arm or excavation arm.

Arm 4 has an hydraulic jack 5 or like operating means, to impart shovel 2 movements through an articulated parallelogram system that includes two arched rods 8 and 9, with rod 8 hinged at 10 on the articulated arm 4 and rod 9 hinged at 11 on shovel 2.

Rods 8 and 9 are also connected to each other through a pin 7 to which also the mobile stem of hydraulic jack 5 is connected. As is known, the activation of hydraulic jack 5 acts on the articulated parallelogram system to cause the rotation of shovel 2 about pin 3.

According to the present invention, the excavator shown in the figures is provided with an auxiliary device including a grip element 12, which is moved by the same jack 5 that actuates shovel 2, in such a manner that shovel 2 and grip element 12 are mutually movable between an opening position (Figure 1) and a closing position (Figure 2).

There are in fact provided rigid mechanical connection means constituted by a couple of rods 13 that connect grip element 12 to the rotation operating means of shovel 2. In particular, as shown, rods 13 are hinged at one of their ends on grip element 12 at 14, while at the opposite end the rods 13 are connected to pin 7 that connects in its turn stem 6 of jack 5 and the arched rods 8 and 9 of the articulation system of shovel 2.

In this way, grip element 12 is mechanically shifted in translation along a rectilinear direction between the two mutual opening and

closing positions shown in Figures 1 and 2, an additional jack for the control of the movement of grip element 12 being unnecessary.

Figures 5 and 6 show with more details some parts of the auxiliary device according to the present invention. Grip element 12 includes a T-shaped base portion 15 which is slidingly engaged in guide means 16 fastened to the articulated arm 4.

Guide means 16 include a plate 17 that is permanently fastened to arm 4, for instance by welding or any other know means that allows to prevent the weakening of said arm.

Two L-shaped uprights 19 are fastened on plate 17, that are fastened to plate 17 by means of nuts 20 that allow, if necessary, the possible removal of uprights 19.

As can be see in particular in the view of Figure 3, grip element 12 includes a grip portion having a width smaller than the width of shovel 2. In this manner, grip element 12 does not hinder the movements of shovel 2 during the excavation works and can therefore be kept mounted without creating problems for the excavator utilization. However, if necessary, grip element 12 can be removed in a rapid and simple manner, as is explained hereunder.

In fact, according to an advantageous aspect of the present invention, pin 7 to which rods 13 are connected, as well as stem 6 of jack 5 and arched rods 8 and 9, is removable to allow a rapid removal or reinstallation of the auxiliary device. Pin 7 is in fact locked on both sides in a suitable way, for instance by means of pegs or split pins 18 (one of which can be seen in Figures 1 and 2).

In this way, there is no need to completely remove pin 7 from the articulation system, but only pegs or split pins 18 need being removed to release the engagement between pin 7 and rods 13, by extracting only slightly pin 7 first from one side and then from the other

side. This allows to remove the connection of rods 13 to the articulated system of the excavator and to extract then the grip element 12 from guide means 16. Pegs or split pins 18 are then mounted again in their position to prevent pin 7 from extraction during excavation works.

The restoring of grip element 12 can be effected as much rapidly by carrying out the same operations reversed, again without completely removing pin 7 from the articulation system of the excavation tool.

As can be seen in the figures, and in particular in Figures 1 to 3, both ends of guide means 16 are open for a more easy insertion or extracting of base portion 15 from either end. Once grip element 12 is removed, only plate 17 and uprights 19 remain fastened to arm 4, and it is therefore possible to utilize only the excavation tool 2.

The open ends of guide means 16 offer another advantage. In fact, they allow base portion 15 to protrude from its ends when grip element 12 is, for instance, in the opening position with respect to shovel 2 (Figure 1) or also in the closing position with respect to shovel 2 (Figure 2). In this way, possible residues or material debris can be expelled from guide means 16 without dismounting the same, thus rendering the possible maintenance operations particularly simple and economical.

The working of the auxiliary device according to the invention is extremely simple. The rigid mechanical connection means that operate the translation of grip element 12 along guide means 16 are, as mentioned above, made up by rods 13 which link the grip element 12 to pin 7. When the hydraulic jack 5 actuates in rotation shovel 2, rods 13 are shifted consequently and drag grip element 12 in translation along guide means 16, approaching to or moving away from shovel 2. In this way it is possible to grasp loads L having a size

much greater than that of shovel 2, as can be seen for instance in Figure 4.

Various modifications may be introduced without falling outside the scope of the present invention. For instance, in the embodiment described herein, rods 13 show a slight curvature in their central portion to prevent possible interference with a load kept between excavation tool 2 and grip element 12 in the mutual closing position (Figure 2). However, rods 13 may have any shape whatever, provided that it is suitable for the purpose, for instance a rectilinear shape, or have a more marked curvature with respect to the one shown.